

1 1. In a video management system configured to receive a video stream
2 containing one or more video pictures that are each divided into blocks, wherein the video
3 management system is to provide a representation of the one or more video pictures to a
4 subsample decoder for subsampling, a method of reducing the size of the one or more
5 frames with minimal, if any, effect on the video quality generated from the one or more
6 frames after subsampling, the method comprising the following:
7

8 accessing a video picture that is to be subsampled; and
9 for at least one block of the video picture, reducing the size of the block to
10 generate a reduced size block in such a way that subsampled decoding the reduced
11 size block results in substantially the same reduced size image as subsampled
12 decoding the original block.

13 2. The method in accordance with Claim 1, wherein the method further
14 comprises the following:

15 providing the video picture with its one or more reduced size blocks to the
16 subsample decoder.

17 3. The method in accordance with Claim 1, wherein the method further
18 comprises the following:

19 subsampled decoding the video picture.

20 4. The method in accordance with Claim 3, wherein the method further
21 comprises the following:

22 displaying the subsample decoded video picture on a display device.
23

- 1
- 2 5. The method in accordance with Claim 3, further comprising the following:
3 displaying the subsample decoded video picture on a display device as a
4 reduced sized picture of a picture-in-picture display.
- 5
- 6 6. The method in accordance with Claim 1, wherein the act of reducing the size
7 of the block to generate a reduced size block comprising the following:
8 representing the block as a matrix;
9 pre-multiplying the block matrix by a pre-multiplication matrix, the pre-
10 multiplication matrix generated from a first subsample matrix that represents the
11 subsampled decoding in a first direction; and
12 post-multiplying the block matrix by a post-multiplication matrix generated
13 from a second subsample matrix that represents the subsampled decoding in a second
14 direction that is substantially perpendicular to the first direction.
- 15
- 16 7. The method in accordance with Claim 6, further comprising:
17 receiving an indication over a network that the subsample decoder is to
18 operate on the video stream.
- 19
- 20 8. The method in accordance with Claim 6, further comprising:
21 receiving the first and second subsample matrix over a network from the
22 subsample decoder.
- 23
- 24 9. The method in accordance with Claim 6, wherein the first subsample matrix

1 is a vertical subsample matrix that represents the vertical subsampling that is to be
2 performed by the subsample decoder, and wherein the second subsample matrix is a
3 horizontal subsample matrix that represents the horizontal subsampling that is to be
4 performed by the subsample decoder, the method further comprising the following:

5 generating the pre-multiplication matrix by performing the following:

6 determining a first inverse matrix that represents the multiplication
7 inverse of a matrix that results from the multiplication of a first transform
8 matrix times the vertical subsampling matrix; and

9 multiplying the first inverse matrix by the vertical subsampling matrix
10 to generate the pre-multiplication matrix.

11
12 10. The method in accordance with Claim 9, wherein determining a first inverse
13 matrix that represents the multiplication inverse of a matrix that results from the
14 multiplication of a first transform matrix times the vertical subsampling matrix comprises
15 the following:

16 determining a first inverse matrix that represents the multiplication inverse of
17 a matrix that results from the multiplication of a vertical discrete cosine transform
18 matrix times the vertical subsampling matrix.

19
20 11. The method in accordance with Claim 9, wherein determining a first inverse
21 matrix that represents the multiplication inverse of a matrix that results from the
22 multiplication of a first transform matrix times the first subsampling matrix comprises the
23 following:

24 determining a first inverse matrix that represents the multiplication inverse of

1 a matrix that results from the multiplication of a vertical wavelet transform matrix
2 times the first subsampling matrix.

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4 12. The method in accordance with Claim 9, further comprising the following:

5 generating the post-multiplication matrix by performing the following:

6 determining a second inverse matrix that represents the multiplication
7 inverse of a matrix that results from the multiplication of a second transform
8 matrix times the transpose of the horizontal subsampling matrix; and

9 multiplying the transpose of the horizontal subsampling matrix by the
10 second inverse matrix to generate the post-multiplication matrix.

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12 13. The method in accordance with Claim 12, wherein determining a second
13 inverse matrix that represents the multiplication inverse of a matrix that results from the
14 multiplication of a second transform matrix times the horizontal subsampling matrix
15 comprises the following:

16 determining a second inverse matrix that represents the multiplication inverse
17 of a matrix that results from the multiplication of a horizontal discrete cosign
18 transform matrix times the horizontal subsampling matrix.

19

20 14. The method in accordance with Claim 12, wherein determining a second
21 inverse matrix that represents the multiplication inverse of a matrix that results from the
22 multiplication of a second transform matrix times the horizontal subsampling matrix
23 comprises the following:

24 determining a second inverse matrix that represents the multiplication inverse of a

1 matrix that results from the multiplication of a horizontal wavelet transform matrix times the
2 horizontal subsampling matrix.

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4 15. The method in accordance with Claim 12, further comprising the following:
5 horizontal subsampling the video picture using the horizontal subsampling
6 matrix; and

7 vertical subsampling the video picture using the vertical subsampling matrix.

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10 16. The method in accordance with Claim 1, wherein the at least one block of the
11 video picture comprises all the blocks in the video picture.

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13 17. The method in accordance with Claim 1, wherein the act of accessing a video
14 picture that is to be subsampled comprises the following:

15 accessing a video frame that is to be subsampled.

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17 18. The method in accordance with Claim 1, wherein the act of accessing a video
18 picture that is to be subsampled comprises the following:

19 accessing a video frame that is to be subsampled.

1 19. In a video management system configured to receive a video stream
2 containing one or more video pictures that are each divided into blocks, wherein the video
3 management system is to provide a representation of the one or more video pictures to a
4 subsample decoder for subsampling, a method of reducing the size of the one or more
5 frames with minimal, if any, effect on the video quality generated from the one or more
6 frames after subsampling, the method comprising the following:

7 accessing a video picture that is to be subsampled; and

8 for at least one block of the video picture, performing the following:

9 representing the block as a matrix;

10 pre-multiplying the block matrix by a pre-multiplication matrix, the
11 pre-multiplication matrix generated from a first subsample matrix that
12 represents the subsampled decoding in a first direction; and

13 post-multiplying the block matrix by a post-multiplication matrix
14 generated from a second subsample matrix that represents the subsampled
15 decoding in a second direction that is substantially perpendicular to the first
16 direction.

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18 20. The method in accordance with Claim 19, wherein the method further
19 comprises the following:

20 providing the video picture with its one or more reduced size blocks to the
21 subsample decoder.

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23 21. The method in accordance with Claim 19, wherein the method further
24 comprises the following:

1 subsampled decoding the video picture.

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3 22. The method in accordance with Claim 19, wherein the method further
4 comprises the following:

5 displaying the subsample decoded video picture on a display device.

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1 23. A video management system configured to receive a video stream containing
2 one or more video pictures that are each divided into blocks, wherein the video management
3 system is to provide a representation of the one or more video pictures to a subsample
4 decoder for subsampling, the video management system comprising the following:

5 means for accessing a video picture; and

6 means for transcoding the video picture such that subsampled decoding the
7 reduced size picture results in substantially the same reduced size image as
8 subsampled decoding the original video picture.

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1 24. A video management system configured to receive a video stream containing
2 one or more video pictures that are each divided into blocks, wherein the video management
3 system is to provide a representation of the one or more video pictures to a subsample
4 decoder for subsampling, the video management system comprising the following:
5 a memory configured to store one or more video pictures; and
6 a transcoder configured to perform the following:
7 accessing a video picture from the memory;
8 for at least one block of the video picture, performing the following:
9 representing the block as a matrix;
10 pre-multiplying the block matrix by a pre-multiplication matrix, the
11 pre-multiplication matrix generated from a first subsample matrix that
12 represents the subsampled decoding in a first direction; and
13 post-multiplying the block matrix by a post-multiplication matrix
14 generated from a second subsample matrix that represents the subsampled
15 decoding in a second direction that is substantially perpendicular to the first
16 direction.
17

1 25. A video network comprising the following:

2 a video management system configured to perform the following:

3 accessing a video picture;

4 transcoding the video picture so as to reduce the size of the video

5 picture without introducing error as measure after subsampling; and

6 a video node coupled to the video management system so as to receive the

7 transcoded video picture from the video management system, the video node further

8 configured to subsample the transcoded video picture; and

9 a display device coupled to the video node so as to receive the subsampled

10 video picture, the display device further configured to display the subsampled video

11 picture.